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**METHOD AND APPARATUS FOR DISPLAYING TELEVISION
PROGRAMS AND RELATED TEXT**

Background of the Invention

15 This invention relates to the field of television and, more particularly, to a method and apparatus for simultaneously displaying video programs and related text on a television screen.

20 For a number of years television receivers have been equipped with picture-in-picture (PIP) capability. In PIP format, the moving, real time images of one television channel are displayed on the background of the screen and the moving, real time images of another television channel are displayed in a PIP window overlaid on a small area of the background. Because two channels are simultaneously
25 displayed by the television receiver, two tuners are required. The viewer enters the PIP mode by pressing a PIP key of his or her controller. Then, the viewer can change either the channel of the background or the channel of the PIP by resetting the appropriate tuner. To reverse
30 the background and PIP images, the viewer simply presses a SWAP key. To collapse the PIP window, the viewer again presses the PIP key.

35 Television program guides help television viewers select programs to watch. Such television program guides list the available television programs by day of the week, time of day, channel, and program title. For many years television program guides have been published in hard copy

1 form. More recently as illustrated by Levine Patent
4,908,713, television program guides have begun to take an
electronic form. In other words, the schedule of program
listings is stored in an electronic memory connected to
5 the television receiver. The program listings are
recalled from memory by the viewer on command for display
on the television screen.

Despite the prevalence of television program guides,
many viewers still make their program selections by
10 switching the television tuner from channel to channel and
observing on the screen what program is being received on
the respective channels. This process is sometimes called
"grazing."

Emanuel Patent 5,161,019 discloses an automated form
15 of channel grazing. A preselected group of channels are
sequentially scanned by switching the tuner of the
television receiver from channel to channel. A still
image of the program received on each channel is stored in
a memory. After all the channels have been scanned, the
20 still images from all the channels are simultaneously
displayed on the television screen. This process gives
the viewer more information about the program choices in
addition to that obtainable from a television program
guide, namely, the displayed still images of the actual
25 programs.

Summary of the Invention

According to the invention, moving images of a
television program, and are displayed in a PIP window on
30 the screen of a television monitor and textual information
related to the television program is displayed in the
background on the screen. Preferably, the audio portion
of the television program displayed in the PIP window is
also reproduced by the sound system of the television
35 monitor. The textual information is arranged on the screen
so none of it is covered by the moving images.

1 In one embodiment, the textual program related
information (PRI) is a television program schedule. One
of the program listings of the schedule identifies by
title and time and/or channel the television program in
5 the PIP window, which comprises moving images.

 To facilitate channel grazing, a television viewer
can use a PIP format for display of current television
program listings from a program schedule data base in the
background and moving, real time images of a program
10 selected from the displayed listings in the PIP window.
Specifically, as the viewer selects a particular program
from the displayed current television program listings by
means of a cursor or a code number, the corresponding
program automatically appears in the PIP window. In this
15 way, the user can channel graze by sequentially selecting
the individual program listings in the background. When
the user finds a program that the user wishes to watch,
the user can reverse the background and PIP window and
then collapse the window, leaving the desired program on
20 the full screen.

 To permit the viewing of programs scheduled for the
future broadcast without losing sight of the current
program being watched, a television viewer can use a PIP
format for display of television program listings for a
25 specific channel from a program schedule data base in the
background and moving, real time images of the current
program on that channel in the PIP window. Specifically,
as the viewer changes channels, the current program on
that channel automatically appears in the PIP window. The
30 viewer can control the background to display program
listings for a period of days, i.e., a week, in the
future. In this way, the user can continue to watch a
television program while ascertaining the future programs
on the channel to which the television tuner is set.
35 When the viewer finds a program that the viewer wishes to
watch, the background disappears, leaving the program on
the channel to which the tuner is set on the full screen.

1 In another embodiment, a television viewer can use a
PIP format for display of future television program from
a program schedule data base in the background and moving,
5 images of a video clip of a program listing in the
background display selected for example by a cursor.

 In yet another embodiment, the textual program
related information (PRI) is a message that is broadcast
in the vertical blanking interval of the television signal
contemporaneously with the television program displayed in
10 the PIP window.

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1 **Brief Description of the Drawings**

 The features of specific embodiments of the best mode contemplated of carrying out the invention are illustrated in the drawings, in which:

5 FIG. 1 is a schematic block diagram of a television receiver incorporating the principles of one embodiment of the invention;

 FIGS. 2, 3, and 4 are television screens formatted in accordance with the embodiment of FIG. 1;

10 FIG. 5 is a schematic block diagram of part of a television receiver incorporating the principles of another embodiment of the invention;

 FIGS. 6 and 7 are television screens formatted in accordance with the embodiment of FIG. 5; and

15 FIG. 8 is a television screen formatted to simulate a picture-in-picture window.

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1 **Detailed Description of a Specific Embodiment**

 In the following description of the embodiments of
the invention, common reference numerals are used to
represent the same components. If the features of all the
5 embodiments are incorporated into a single system, these
components can be shared and perform all the functions of
the described embodiments.

 With reference to FIG. 1 in a current program guide
(CPG) mode, a source of television signals 10 such as a
10 terrestrial antenna, a satellite antenna, or a cable is
connected to a television tuner 12. The output of tuner
12 is a video signal, i.e., a base band or unmodulated
signal, coupled to the video input of a video cassette
recorder (VCR) 60. (Alternatively, television signal
15 source 10 could be directly connected to the RF input of
VCR 16, if its internal tuner is to be utilized.) Tuner
12 is directly connected to one input of a switch 14 and
is connected to the other input of switch 14 through VCR
60. The output of switch 14 is connected to one input of
20 a conventional picture-in-picture (PIP) integrated circuit
chip 18. The output of PIP chip 18 is connected to the
video input of a television receiver or monitor 20 having
a screen (not shown).

 An updatable data base of the schedule of program
25 listings of all the available channels for a prescribed
period of time, e.g. one week, is electronically stored in
a program schedule memory 22. These program listings
typically include for each program the title, a brief
program description, the day of the week, the time of the
30 day, and the channel on which the program is transmitted
and thus available for reception at source 10. The data
base can be updated by a continuous data link in the
vertical blanking interval (VBI) of one television channel
broadcast to the television receiver in well know fashion.
35 Alternatively, the data base can be updated by unplugging
memory 22 and replacing it with a memory having the
updated data base. Memory 22 is connected to a

1 microprocessor 24 that is programmed to control the
operation of the described equipment. An operating
program for microprocessor 24 is stored in a read only
memory (ROM) 26. A viewer input device 28, preferably in
5 the form of a remote IR controller, is coupled to
microprocessor 24 to provide commands from the viewer. A
video processor 30 is coupled to microprocessor 24. When
the viewer wishes to see television program listings,
microprocessor 24 recalls a portion of the program
10 schedule data base from memory 22 and couples it to video
processor 30, where the program listings are formatted for
display. Video processor 30 is connected to the other
input of PIP chip 18. Preferably, input device 28
controls microprocessor 24 by cursor movement on the
15 screen of television receiver 20. To this end,
microprocessor 24 and video processor 30 are coupled to a
cursor position register 32. (Alternatively, the viewer
can select items of information displayed on the screen by
keying into viewer input device 24 code numbers assigned
20 to these items.) Microprocessor 24 is also coupled to
tuner 12 for channel change, to VCR 16 for play/record
selection and start/stop, to switch 14 for selection of
one of its inputs, and to PIP chip 18 for selection of the
mode of PIP operation.

25 In FIG. 2, the screen format in the CPG mode
comprises a background area 40 and an overlaid PIP window
42 in the upper right hand corner of the screen.
Background area 40 includes a banner area 43 at the top of
the screen, a program description area 44 in the upper
30 left hand corner of the screen adjacent to PIP window 42,
and a program schedule area 46 in the form of a time-
channel grid below areas 42 and 44. Banner area 43
contains the day of the week, the time of day, and other
identifying information. All three of these areas of the
35 background are formatted in video processor 30. The
memory space of video processor 30 corresponding to the
area in which PIP window 42 appears on the screen is left

1 blank; i.e., although overlaid on background area 40, PIP
window 42 does not cover up any of the information of
background area 40. The channel numbers or names are
5 displayed in a column on the left side of area 46 and the
time of day is displayed in a row at the top of area 46.
By means of a cursor control key set on input device 28
such as a pair of up/down arrows, the viewer can move a
cursor 48 vertically to highlight the title of one of the
10 currently playing television programs displayed on area
46. When the cursor reaches the top or bottom of the grid
in area 46, microprocessor 24 recalls further program
listings from program schedule memory and video processor
30 formats these program listings so further channels
15 either above "HBO" or below "Disc" in the program schedule
layout can be displayed. The moving, real time images of
the current television program highlighted by cursor 48
are displayed in PIP window 42 and the program description
of the highlighted program is displayed in area 44.
20 Preferably, the audio portion of the television program
displayed in PIP window 42 is also reproduced by the sound
system of monitor 20. The PIP display and the program
description in area 44 enable the viewer to assess better
whether or not to watch the highlighted program. As the
viewer moves cursor 48 vertically from channel to channel,
25 the current television program displayed in window 42 and
the program description displayed in area 44 automatically
change accordingly to match the highlighted program in
area 46. As the cursor moves from channel to channel,
microprocessor 24 recalls the program description for the
30 highlighted program from program schedule memory 22 and
video processor 30 formats this program description so it
can be displayed in area 44.

It should be noted that the display of future program
listings in area 46 is not necessary to practice the
35 invention. Therefore, the program schedule displayed in
area 46 in the CPG mode presented in a different format,

1 e.g., separate vertical columns for channel, program
title, start time, and ending time.

5 In the program schedule memory, the program listings
are coded by day of the week, time of day, and channel so
that they can be accessed by microprocessor 24 when
necessary to supply program schedule data to video
processor 30 to compose the time-channel grid and the
program descriptions. Microprocessor 24 has a real time
10 clock (not shown) the time of which is compared with the
time of day and day of the week codes to select the
program listings for the CPG mode. The functional storage
areas of cursor position register 32 are mapped to the
storage areas of vector processor 30 where the program
schedule is formatted for display on screen area 40 so
15 cursor position register 32 points to the area of the
screen, and thus the particular program, that is
highlighted by cursor 48. By comparing the cursor
position in register 32 with the channel corresponding to
the highlighted area of video processor 30, the channel of
20 the highlighted program is derived and coupled to
microprocessor 24. Microprocessor 24 then sets tuner 12
to this channel.

In operation, starting from a full screen display of
the real time television program, the viewer first
25 depresses a CPG mode key on input device 28 to set up the
format shown in FIG. 2. Microprocessor 24 recalls the
appropriate program listings from memory 22 and transmits
them to video processor 30 where the time-channel grid of
area 46 and the program description of the highlighted
30 program in area 44 are composed. At the same time,
microprocessor 24 operates switch 14 so the output of
tuner 12 is directly connected to the one input of PIP
chip 18 and switches PIP chip 18 into a PIP mode, such
that the input from tuner 12 is displayed in the PIP
35 window and the program schedule from video processor 30 is
displayed in the background. Microprocessor 24 senses the
channel to which the tuner is set at when the CPG mode is

1 entered, and initially positions cursor 48 at the title of
the program broadcast on this channel. As the viewer
moves the up/down arrows of the cursor control key set,
tuner 12 is reset accordingly and new program schedule
5 information is fed through microprocessor 24 to video
processor 30 to recompose the time-channel guide so cursor
48 remains visible and the program description remains
current. The described CPG mode facilities channel
grazing by the viewer. When the viewer finds the video
10 program he or she wishes to watch, the viewer presses the
CPG mode key again. As a result, microprocessor 24
switches PIP chip 18 out of the PIP mode, such that the
video program inputted from tuner 12 is displayed full
screen.

15 If the viewer wishes to record the program
highlighted in the CPG mode, the viewer commands
microprocessor 24 to turn on VCR 16 for recording.

If the viewer wishes to play a video tape cassette on
VCR 16, the viewer commands microprocessor 24 to turn on
20 VCR for playback and to operate switch 14 for connection
of the output of VCR 16 through PIP chip 18 to television
receiver 20.

The television receiver of FIG. 1 can also be
operated in a channel specific guide (CSG) mode. In FIG.
25 3, the screen format in the CSG mode comprises in addition
to PIP window 42, banner area 43, and program description
area 44, a program schedule area 50 in the form of
vertical columns of the current day's times and program
titles for the channel to which the tuner is set. In this
30 mode, banner area 43 includes the channel number and/or
name and real time images of the current television
program on the channel are displayed in PIP window 42.

In operation, starting from a full screen display of
the real time television program, the viewer first
35 depresses a CSG mode key on input device 28 to set up the
format shown in FIG. 3. Microprocessor 24 senses the
channel to which the tuner is set when the CPG mode is

1 entered to select the program schedule listings for area
50. Microprocessor 24 recalls the appropriate program
listings from memory 22 and transmits them to video
processor 30 where the time and title columns of area 50
5 and the program description of the highlighted program in
area 44 are composed. At the same time, microprocessor
24 operates switch 14 so the output of tuner 12 is
directly connected to the one input of PIP chip 18 and
switches PIP chip 18 into a PIP mode, such that the input
10 from tuner 12 is displayed in the PIP window and the
program schedule from video processor 30 is displayed in
the background. If the program listings for the day
extend to a number of screens, the viewer presses a next
screen key until the desired program listings are
15 displayed; the screens recycle in time order. To see
another day's program listings for the same channel, the
viewer presses a next day key until the desired day is
displayed and to return to the current day the viewer
presses the next day key until the schedule recycles,
20 e.g., seven days. In summary, the program schedule
listings for the channel to which tuner 12 is set are
displayed in area 50, a description of future programming
on this channel is displayed in area 44, and the real time
television program for this channel is displayed in PIP
25 window 42.

When the viewer changes channels, the program
listings for the new channel are displayed in area 50, a
description of future programming on the new channel is
displayed in area 44, and the real time television program
30 for the new channel is displayed in PIP window 42. Thus,
by moving from channel to channel in this mode, the viewer
sees the real time television program on selected channel
and the program schedule listings and a description of
future programming for that channel. The described CSG
35 mode permits the viewer to see the program schedule
listings for a channel without losing sight of any of the
image of the real time television program on the channel.

1 When the viewer finds the video program he or she wishes
to watch, the viewer presses the CSG key again. As a
result, microprocessor 24 switches PIP chip 18 out of the
PIP mode, such that the video program inputted from tuner
5 12 is displayed full screen.

The television receiver of FIG. 1 can also be used
with the format of FIG. 3 in an extension of the CSG mode
to display previews of future programming as video clips.
The video clips are stored on a video tape cassette that
10 is loaded into VCR 16. The addresses of the video clips
on the tape of the video cassette are stored in program
schedule memory 22 as part of the data base. These
addresses are linked to the respective future program
listings in the data base so that a video clip can be
15 accessed on the tape when a program listing is designated
in the database. When the viewer presses the CSG mode
key, in addition to the operation as described in
connection with FIG. 3, microprocessor 24 highlights the
current program title with cursor 48, as illustrated in
20 FIG. 3. So long as cursor 48 highlights the title of the
current program, the CSG mode operates as described above.
When the viewer moves cursor 48 vertically by operating
the cursor control key set on input device 28 to highlight
the title of a future program displayed in area 50, the
25 address of the video clip of the highlighted program
listing is retrieved by microprocessor 24 from program
schedule memory 22 and transmitted to VCR 16. The video
clip is retrieved from the tape in VCR 16 and coupled
through switch 14 and PPI chip 18 to television receiver
30 24 for display in PIP window 42. The video clips on the
tape of the videocassette are indexed and accessed in the
manner described in copending application Serial
No. 08/176,852, filed on December 30, 1993 and entitled
ENHANCING OPERATIONS OF VIDEOTAPE CASSETTE PLAYERS, the
35 disclosure of which is incorporated fully herein by
reference.

1 An extension of the CPG mode illustrated in FIG. 2
also permits display of video clips of future programming.
Specifically, in the time-channel grid format
microprocessor 24 also controls cursor 48 responsive to
5 the cursor key set of viewer input device 28, which in
this embodiment includes a horizontal cursor control, such
as a pair of right/left arrows. As described above, the
address for the highlighted future program listing is
retrieved by microprocessor 24 from program schedule
10 memory 22 and transmitted to VCR 16 to access the
corresponding video clip, which is displayed in PIP window
42.

 Another embodiment in which video clips can be
displayed in PIP window 42 is illustrated in FIG. 4. In
15 addition to banner area 43 and program description area
44, background area 40 has program schedule area 52, in
which program listings are displayed by theme such as
movies, sports, current events, etc. Area 52 contains a
column for program start time, a column for program
20 channel, and a column for program title. To implement
this embodiment, the program listings of the data base
stored in program schedule memory 22 are also coded by
theme so that they can be accessed by microprocessor 24 in
response to the user selection of themes from an on-screen
25 menu in well known fashion. As described in connection
with the extended CPG and CSG modes described above, when
the title of a future program listing is highlighted by
cursor 48, the corresponding moving image video clip is
displayed in PIP window 42. If desired, a video disc
30 player could be substituted for VCR 16 to provide the
video clips to switch 14 in order to speed up the access
time to the moving images displayed in PIP window 42.

 In another embodiment, program related information
(PRI) is displayed in background area 40 while the real
35 time television program to which the PRI relates is
displayed in PIP window 42. The PRI is transmitted in the
vertical blanking interval (VBI) of the television signal

1 of the channel carrying the television program to which
the PRI relates, contemporaneously with this television
program. As illustrated in FIG. 5, to implement this
embodiment a VIB decoder 54 is connected between the
5 output of tuner 12 and microprocessor 24 and a PRI memory
56 is connected to microprocessor 24. The PRI is stripped
from the VBI of the television signal by decoder 54 and
stored in memory 56 by microprocessor 24.

In operation, when the viewer presses a PRI key on
10 viewer input device 28 the real time television program of
the channel to which tuner 12 is set, is displayed in PIP
window 42. In addition to banner area 43 and program
description area 44, background area 40 has a PRI area 58
in which different types of PRI are displayed. In FIG. 6
15 the real time television program is a cooking
demonstration by Julia Child and the PRI displayed in area
58 is a recipe made in the course of the demonstration.
Other information about the program is displayed in area
44. In FIG. 7 the real time television program is a
20 commercial for Lexis automobile and the PRI displayed in
area 58 is a test drive offer for Lexis. The name and
address of the local Lexis dealer in the geographic area
of the viewer is displayed in area 44.

As illustrated in FIG. 8, if the viewer does not have
25 a television receiver with a PIP chip, the same screen
format is still displayed in the CPG, CSG and PRI modes.
Text composed in video processor 30 is displayed in PIP
window 42 instead of moving real time or video clip
images. For example, in any of the described modes the
30 displayed information could be locally derived, such as
time of day or received in the VBI such as weather,
traffic, or news headlines.

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